

CLAIMS

1
2 1. An irrigation system for disturbing water to soil, the irrigation system
3 comprising:

4 a sprinkler comprising:

5 an inlet coupling disposed to receive water from a source of pressurized
6 water;

7 a head comprising a cover having an outlet aperture, the head further
8 comprising a plurality of flow control features, each of which is movable into
9 fluid communication with the outlet aperture to control distribution of water
10 received through the inlet coupling to the soil through the outlet aperture; and

11 a drive mechanism coupled to the cover to induce reversing rotation of the
12 outlet aperture about a generally vertical axis through an angle of rotation, the
13 drive mechanism comprising a reduction gear train that conveys torque from the
14 rotor to the cover with a positive mechanical advantage, wherein the reduction
15 gear train is exposed to the water received through the inlet coupling.

16
17 2. The irrigation system of claim 1, wherein the flow control features are
18 disposed within a chamber defined by the cover.

1 3. The irrigation system of claim 2, wherein the cover comprises a
2 substantially tubular shape having an outer wall, wherein the outlet aperture is formed in
3 the outer wall, wherein the head further comprises a flow control member comprising a
4 substantially tubular shape comprising an outer wall in which the flow control features
5 are formed, wherein the flow control member is rotatable about the generally vertical
6 axis.

7 4. The irrigation system of claim 3, wherein the head further comprises a
8 plenum chamber within the flow control member, wherein all of the flow control features
9 are simultaneously in fluid communication with the inlet coupling via the plenum
10 chamber.

11
12 5. The irrigation system of claim 1, wherein the cover comprises a
13 substantially flat plate in which the outlet aperture is formed, wherein the head further
14 comprises a flow control member comprising a plurality of tubular extensions, each of
15 which is disposed to convey water to one of the flow control features, wherein the flow
16 control member is rotatable about the generally vertical axis to align any of the tubular
17 extensions with the outlet aperture.

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19 6. The irrigation system of claim 5, wherein each of the flow control features
20 comprises a nozzle, wherein the head further comprises a deflector flow control member
21 disposed outside the flow control member, wherein the deflector flow control member
22 comprises an outer wall in which a plurality of deflectors are formed, wherein the
23 deflector flow control member is rotatable about the generally vertical axis to align any of
24 the deflectors with any of the nozzles.

1 7. The irrigation system of claim 1, wherein the head further comprises a
2 detent mechanism that urges the flow control features, collectively, to remain in any of a
3 plurality of orientations, wherein in each of the orientations, one of the flow control
4 features is in fluid communication with the outlet aperture.

5
6 8. The irrigation system of claim 1, wherein the plurality of flow control
7 features comprises at least six flow control features comprising a plurality of differently-
8 shaped orifices.

9
10 9. The irrigation system of claim 1, wherein the sprinkler further comprises a
11 body that encases at least a portion of the drive mechanism, wherein the drive mechanism
12 is coupled to first and second levers extending outward with respect to the body, wherein
13 the first and second levers are coupled to first and second arcuate slots, wherein the first
14 and second levers are relatively movable to control the angle of rotation, wherein the
15 head further comprises a dial manually rotatable to move the flow control features into
16 fluid communication with the outlet aperture.

17
18 10. The irrigation system of claim 1, wherein each of the flow control features
19 comprises a nozzle through which the water flows in such a manner that water flow is
20 constricted by the nozzle.

21
22 11. The irrigation system of claim 1, wherein each of the flow control features
23 comprises a deflector extending into the water in such a manner that the deflector does
24 not, by itself, substantially constrict water flow.

1 12. The irrigation system of claim 1, further comprising a base unit
2 comprising a garden hose coupling and a sprinkler coupling, wherein the garden hose
3 coupling is designed to be connected to receive water from a standard garden hose and
4 the sprinkler coupling is in fluid communication with the garden hose coupling and is
5 connectable to the inlet coupling of the sprinkler.

6
7 13. The irrigation system of claim 12, further comprising a valve disposed
8 upstream of the base unit and a timer electrically coupled to the valve to control water
9 flow to the sprinkler.

1 14. An irrigation system for disturbing water to soil, the irrigation system
2 comprising:

3 a sprinkler comprising:

4 a body;

5 an inlet coupling disposed to conduct water into the body from a source of
6 pressurized water;

7 a head comprising a cover having an outlet aperture, the head further
8 comprising a plurality of flow control features, each of which is movable into
9 fluid communication with the outlet aperture to control distribution of water
10 received through the inlet coupling to the soil through the outlet aperture, the head
11 comprising a dial axially displaced from the flow control features, wherein the
12 dial is manually rotatable to move the flow control features into fluid
13 communication with the outlet aperture; and

14 a drive mechanism, at least a portion of which is encased by the body,
15 wherein the drive mechanism is coupled to the body to induce reversing rotation
16 of the outlet aperture about a generally vertical axis through an angle of rotation,
17 wherein the drive mechanism is coupled to first and second levers extending
18 outward with respect to the body, wherein the first and second levers are
19 relatively movable to control the angle of rotation.

20
21 15. The irrigation system of claim 14, wherein the flow control features are
22 disposed within a chamber defined by the cover.

1 16. The irrigation system of claim 15, wherein the cover comprises a
2 substantially tubular shape having an outer wall, wherein the outlet aperture is formed in
3 the outer wall, wherein the head further comprises a flow control member comprising a
4 substantially tubular shape comprising an outer wall in which the flow control features
5 are formed, wherein the flow control member is rotatable about the generally vertical
6 axis.

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8 17. The irrigation system of claim 16, wherein the head further comprises a
9 plenum chamber within the flow control member, wherein all of the flow control features
10 are simultaneously in fluid communication with the inlet coupling via the plenum
11 chamber.

12
13 18. The irrigation system of claim 14, wherein the cover comprises a
14 substantially flat plate in which the outlet aperture is formed, wherein the head further
15 comprises a flow control member comprising a plurality of tubular extensions, each of
16 which is disposed to convey water to one of the flow control features, wherein the flow
17 control member is rotatable about the generally vertical axis to align any of the tubular
18 extensions with the outlet aperture, wherein the dial is fixedly attached to the flow control
19 member.

1 19. The irrigation system of claim 18, wherein each of the flow control
2 features comprises a nozzle, wherein the head further comprises a deflector flow control
3 member disposed outside the flow control member, wherein the deflector flow control
4 member comprises an outer wall in which a plurality of deflectors are formed, wherein
5 the deflector flow control member is rotatable about the generally vertical axis to align
6 any of the deflectors with any of the nozzles.

7
8 20. The irrigation system of claim 15, wherein the plurality of flow control
9 features comprises at least six flow control features comprising a plurality of differently-
10 shaped orifices.

11
12 21. The irrigation system of claim 14, wherein each of the flow control
13 features comprises a nozzle through which the water flows in such a manner that water
14 flow is constricted by the nozzle.

15
16 22. The irrigation system of claim 14, wherein each of the flow control
17 features comprises a deflector extending into the water in such a manner that the deflector
18 does not, by itself, substantially constrict water flow.

19
20 23. The irrigation system of claim 14, further comprising a base unit
21 comprising a garden hose coupling and a sprinkler coupling, wherein the garden hose
22 coupling is designed to be connected to receive water from a standard garden hose and
23 the sprinkler coupling is in fluid communication with the garden hose coupling and is
24 connectable to the inlet coupling of the sprinkler.

1 24. The irrigation system of claim 23, further comprising a valve disposed
2 upstream of the base unit and a timer electrically coupled to the valve to control water
3 flow to the sprinkler.

1 25. A sprinkler for distributing water to soil, the sprinkler comprising:
2 an inlet coupling disposed to receive water from a source of pressurized water;
3 and
4 a head comprising a cover having an outlet aperture, the head further comprising a
5 plurality of nozzles, each of which is movable into fluid communication with the outlet
6 aperture to control distribution of water received through the inlet coupling to the soil
7 through the outlet aperture;
8 wherein all of the nozzles are simultaneously in fluid communication with the
9 inlet coupling.

10
11 26. The sprinkler of claim 25, wherein the nozzles are disposed within a
12 chamber defined by the cover.

13
14 27. The sprinkler of claim 26, wherein the cover comprises a substantially
15 tubular shape having an outer wall, wherein the outlet aperture is formed in the outer
16 wall, wherein the head further comprises a flow control member comprising a
17 substantially tubular shape comprising an outer wall in which the nozzles are formed,
18 wherein the flow control member is rotatable about a generally vertical axis, wherein the
19 head further comprises a dial extending from the flow control member, wherein the dial
20 protrudes from the cover to permit rotation of the flow control member with respect to
21 the cover via manual rotation of the dial.

1 28. The sprinkler of claim 27, wherein the head further comprises a plenum
2 chamber within the flow control member to provide continuous fluid communication
3 between the nozzles and the inlet coupling.
4

5 29. The sprinkler of claim 27, wherein the plurality of nozzles comprises at
6 least six nozzles comprising a plurality of differently-shaped orifices.

1 30. A sprinkler for distributing water to soil, the sprinkler comprising:
2 an inlet coupling disposed to receive water from a source of pressurized water;
3 a head comprising a cover having an outlet aperture, the head further comprising a
4 plurality of flow control features, each of which is movable into fluid communication
5 with the outlet aperture to control distribution of water received through the inlet
6 coupling to the soil through the outlet aperture, the head further comprising a dial
7 manually rotatable to move the flow control features into fluid communication with the
8 outlet aperture; and
9 a drive mechanism coupled to the cover to induce reversing rotation of the outlet
10 aperture about a generally vertical axis through an angle of rotation;
11 wherein the dial extends outward with respect to the cover and is displaced from
12 the flow control features toward the inlet coupling.

13
14 31. The sprinkler of claim 30, wherein the cover comprises a substantially flat
15 plate in which the outlet aperture is formed, wherein the head further comprises a flow
16 control member comprising a plurality of tubular extensions, each of which is disposed to
17 convey water to one of the flow control features, wherein the flow control member is
18 rotatable about the generally vertical axis to align any of the tubular extensions with the
19 outlet aperture.

1 32. The sprinkler of claim 31, wherein each of the flow control features
2 comprises a nozzle, wherein the head further comprises a deflector flow control member
3 disposed outside the flow control member, wherein the deflector flow control member
4 comprises an outer wall in which a plurality of deflectors are formed, wherein the
5 deflector flow control member is rotatable about the generally vertical axis to align any of
6 the deflectors with any of the nozzles.

7
8 33. The sprinkler of claim 31, wherein each of the flow control features
9 comprises a nozzle, the head further comprising a cap disposed outside the flow control
10 member, the cap comprising a generally frustoconical shape with an outer wall having a
11 plurality of openings, each of which is aligned with one of the nozzles, wherein the
12 nozzles are oriented to spray the water generally perpendicular to the outer wall.

13
14 34. The sprinkler of claim 33, wherein each of the nozzles is disposed
15 substantially flush with the outer wall.

1 35. A sprinkler for distributing water to soil, the sprinkler comprising:
2 an inlet coupling disposed to receive water from a source of pressurized water;
3 a head comprising a cover having a substantially flat plate in which an outlet
4 aperture is formed, the head further comprising a plurality of flow control features, each
5 of which is movable into fluid communication with the outlet aperture to control
6 distribution of water received through the inlet coupling to the soil through the outlet
7 aperture; and
8 a drive mechanism coupled to the cover to induce reversing rotation of the outlet
9 aperture about a generally vertical axis through an angle of rotation.

10
11 36. The sprinkler of claim 35, wherein the head further comprises a flow
12 control member comprising a substantially flat plate adjacent to the substantially flat
13 plate of the cover, and a plurality of tubular extensions extending from the substantially
14 flat plate of the flow control member, wherein each of the tubular extensions is disposed
15 to convey water to one of the flow control features, wherein the flow control member is
16 rotatable about the generally vertical axis to align any of the tubular extensions with the
17 outlet aperture.

18
19 37. The sprinkler of claim 36, wherein each of the flow control features
20 comprises a nozzle, wherein the head further comprises a deflector flow control member
21 disposed outside the flow control member, wherein the deflector flow control member
22 comprises an outer wall in which a plurality of deflectors are formed, wherein the
23 deflector flow control member is rotatable about the generally vertical axis to align any of
24 the deflectors with any of the nozzles.

1 38. The sprinkler of claim 36, wherein each of the flow control features
2 comprises a nozzle, the head further comprising a cap disposed outside the flow control
3 member, the cap comprising a generally frustoconical shape with an outer wall having a
4 plurality of openings, each of which is aligned with one of the nozzles, wherein the
5 nozzles are oriented to spray the water generally perpendicular to the outer wall.

6
7 39. The sprinkler of claim 38, wherein each of the nozzles is disposed
8 substantially flush with the outer wall.

1 40. A method for irrigating soil through the use of a sprinkler comprising an
2 inlet coupling, a head comprising a plurality of flow control features and a cover having
3 an outlet aperture, and a drive mechanism comprising a reduction gear train, the method
4 comprising:

5 disposing one of the flow control features in fluid communication with the outlet
6 aperture to provide a selected flow control feature;

7 receiving water from a source of pressurized water through the inlet coupling;

8 transmitting torque to the cover with a positive mechanical advantage via the gear
9 train to induce oscillating rotation of the outlet aperture about a generally vertical axis,
10 wherein the reduction gear train is exposed to the water received through the inlet
11 coupling; and

12 distributing the water to the soil through the outlet aperture along a spray pattern
13 controlled by the selected flow control feature.
14

15 41. The method of claim 40, wherein the flow control features are disposed
16 within a chamber defined by the cover, wherein the cover comprises a substantially
17 tubular shape having an outer wall, wherein the outlet aperture is formed in the outer
18 wall, wherein the head further comprises a flow control member comprising a
19 substantially tubular shape comprising an outer wall in which the flow control features
20 are formed, wherein the flow control member is rotatable about the generally vertical
21 axis, wherein the head further comprises a plenum chamber within the flow control
22 member, the method further comprising inducing the water to flow through the plenum
23 chamber to reach all of the flow control features.

1 42. The method of claim 40, wherein the cover comprises a substantially flat
2 plate in which the outlet aperture is formed, wherein the head further comprises a flow
3 control member comprising a plurality of tubular extensions, each of which is disposed to
4 convey water to one of the flow control features, wherein disposing one of the flow
5 control features in fluid communication with the outlet aperture comprises rotating the
6 flow control member about the generally vertical axis to align one of the tubular
7 extensions with the outlet aperture.

8
9 43. The method of claim 42, wherein each of the flow control features
10 comprises a nozzle, wherein the head further comprises a deflector flow control member
11 disposed outside the flow control member, wherein the deflector flow control member
12 comprises an outer wall in which a plurality of deflectors are formed, the method further
13 comprising rotating the deflector flow control member about the generally vertical axis to
14 align any of the deflectors with any of the nozzles.

15
16 44. The method of claim 42, wherein the plurality of flow control features
17 comprises at least six flow control features comprising a plurality of differently-shaped
18 orifices, wherein disposing one of the flow control features in fluid communication with
19 the outlet aperture comprises rotating the flow control member with respect to the cover
20 to dispose at least one of the orifices in fluid communication with the outlet aperture.

1 45. The method of claim 40, wherein the head further comprises a detent
2 mechanism that urges the flow control features, collectively, to remain in any of a
3 plurality of orientations, wherein in each of the orientations, one of the flow control
4 features is disposed in fluid communication with the outlet aperture, wherein disposing
5 one of the flow control features in fluid communication with the outlet aperture
6 comprises overcoming a resistance provided by the detent mechanism to rotate the flow
7 control features within the cover.

8
9 46. The method of claim 40, wherein the sprinkler further comprises a body
10 that encases at least a portion of the drive mechanism, wherein the drive mechanism is
11 coupled to first and second levers extending outward with respect to the body, the method
12 further comprising moving the first lever with respect to the second lever to establish an
13 angle through which the outlet aperture oscillates.

1 47. A method for irrigating soil through the use of a sprinkler comprising a
2 body, an inlet coupling, a head comprising a plurality of flow control features, a cover
3 having an outlet aperture, and a dial, the sprinkler further comprising drive mechanism
4 comprising first and second levers, the method comprising:

5 relatively positioning the first and second levers to establish an angle of rotation
6 of the cover, wherein the first and second levers extend outward with respect to the body
7 and the body encases at least a portion of the drive mechanism;

8 manually rotating the dial to dispose one of the flow control features in fluid
9 communication with the outlet aperture to provide a selected flow control feature,
10 wherein the dial is axially offset from the flow control features;

11 receiving water from a source of pressurized water through the inlet coupling;

12 directing the water to flow through the drive mechanism to induce oscillating
13 rotation of the outlet aperture about a generally vertical axis through the angle of rotation;

14 distributing the water to the soil through the outlet aperture along a spray pattern
15 controlled by the selected flow control feature.

1 48. The method of claim 47, wherein the flow control features are disposed
2 within a chamber defined by the cover, wherein the cover comprises a substantially
3 tubular shape having an outer wall, wherein the outlet aperture is formed in the outer
4 wall, wherein the head further comprises a flow control member comprising a
5 substantially tubular shape comprising an outer wall in which the flow control features
6 are formed, wherein the flow control member is rotatable about a generally vertical axis,
7 wherein the head further comprises a plenum chamber within the flow control member,
8 the method further comprising inducing the water to flow through the plenum chamber to
9 reach all of the flow control features.

10
11 49. The method of claim 47, wherein the cover comprises a substantially flat
12 plate in which the outlet aperture is formed, wherein the head further comprises a flow
13 control member comprising a plurality of tubular extensions, each of which is disposed to
14 convey water to one of the flow control features, wherein disposing one of the flow
15 control features in fluid communication with the outlet aperture comprises rotating the
16 flow control member about the generally vertical axis to align one of the tubular
17 extensions with the outlet aperture.

18
19 50. The method of claim 49, wherein each of the flow control features
20 comprises a nozzle, wherein the head further comprises a deflector flow control member
21 disposed outside the flow control member, wherein the deflector flow control member
22 comprises an outer wall in which a plurality of deflectors are formed, the method further
23 comprising rotating the deflector flow control member about the generally vertical axis to
24 align any of the deflectors with any of the nozzles.

1 51. The method of claim 49, wherein the plurality of flow control features
2 comprises at least six flow control features comprising a plurality of differently-shaped
3 orifices, wherein disposing one of the flow control features in fluid communication with
4 the outlet aperture comprises rotating the flow control member with respect to the cover
5 to dispose at least one of the orifices in fluid communication with the outlet aperture.